

PRODUCT SPECIFICATION

2.4” TN TFT LCD MODULE
MODEL: YDP LCD TN 6 240 M 002



- < ◇ > Preliminary Specification
- < ◆ > Finally Specification

CUSTOMER’S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY
TFT W. Q. H 20230713	TFT S. G. H 20230713	TFT 周福云 20230713	TFT L. Q 20230713



Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2014.08.27		Initial Release	
1.1	2018.04.12	ZDT	Modify Backlight Characteristics Add LED working life Modify many details	P5 P5 P6/P27/P28
1.2	2019.05.04	WQ	Add weight Add Current Consumption Modify Optical Characteristics	P4 P5 P7
1.3	2023.07.13	LQ	Modify Module Parameter Modify AC Characteristics Modify Outline Drawing(B)	P4 P12-14 P25

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1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver lcs, a touch panel and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	2.4"	
LCD type	TN TFT	
Display Mode	Transmissive /Normally white	
Resolution	240 RGB x320	Pixels
View Direction	6 O'clock	Best Image
Gray Scale Inversion Direction	12 O'clock	
Module Outline	42.72 (H) x 59.46 (V) x 3.7(T) (Note1)	mm
Active Area	36.72(H) x 48.96(V)	mm
Pixel Size	153(H) x 153(V)	um
Pixel Arrangement	Stripe	
Polarizer Surface Treatment	Anti-glare	
Display Colors	65K	
Interface	16-bit Parallel MCU	
With or without touch panel	With	
Driver IC	ST7789T3	-
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	15	g

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	-0.3	4.6	V
Storage temperature	T _{STG}	-30	+80	°C
Operating temperature	T _{OP}	-20	+70	°C

Note 1: If Ta below 50°C, the maximal humidity is 90%RH, if Ta over 50°C, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCC	2.4	2.8	3.3	V
Logic Low input voltage	V _{IL}	VSS	-	0.3*VCC	V
Logic High input voltage	V _{IH}	0.7*VCC	-	VCC	V
Logic Low output voltage	V _{OL}	VSS	-	0.2*VCC	V
Logic High output voltage	V _{OH}	0.8*VCC	-	VCC	V
Current Consumption All Black	I _{CC}	-	TBD	-	mA

5. Backlight Characteristic

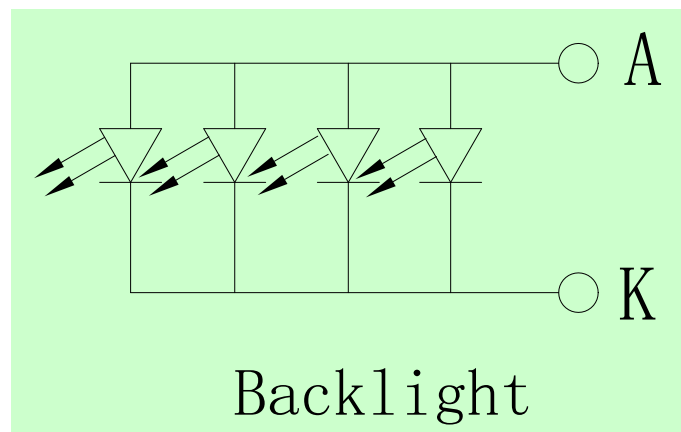
5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	T _a =25 °C, I _F =15mA/LED	2.8	3.2	3.4	V
Forward Current	I _F	T _a =25 °C, V _F =3.2V/LED	-	60	80	mA
Power dissipation	P _D		-	192	272	mW
Uniformity	Avg		-	80	-	%
LED working life(25°C)	-		-	30,000	-	Hrs
Drive method	Constant current					
LED Configuration	4 White LEDs in parallel					

Note1: LED life time defined as follows: The final brightness is at 50% of original brightness.

The environmental conducted under ambient air flow, at T_a=25 ± 2 °C, 60%RH ± 5%, I_F=15mA/LED

5.2. Backlighting circuit



6. Touch Screen Panel Specifications

6.1 Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	(-1.5)	-	(1.5)	%	Analog X and Y directions
Terminal resistance	(150)	-	(550)	Ω	X (Film side)
	(300)	-	(850)	Ω	Y (Glass side)
Insulation resistance	(20)	-	-	M Ω	DC $\leq$ 10V
Voltage	-	-	(10)	V	DC
Chattering	-	-	(10)	ms	

Caution (1): Do not operate it with a thing except a polyacetal pen (tip R0.8mm or less) or a finger nail, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

Caution (2): RTP operation must be followed the parameter condition.

Caution (3): If ask for use glare ITO film , it's will has newton issue.

6.2 Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Activation force	(20)	-	(80)	g	(1)
Durability-surface scratching	Write 20,000	-	-	characters	(2)
Durability-surface pitting	1,000,000	-	-	touches	(3)
Surface hardness	(3)	-	-	H	

Note (1) Stylus pen Input: R0.8mm polyacetal pen or Finger nail

Note (2) Measurement for Surface area

- Force: 150-250gf
- Speed: 60mm/sec
- Stylus: R0.8 polyacetal pen or Finger nail

Note (3) Pit 1,000,000 times on the Film with a R3.75 silicon rubber.

- Force: Force: 2.45N
- Speed: 3times/sec

7. Optical Characteristics

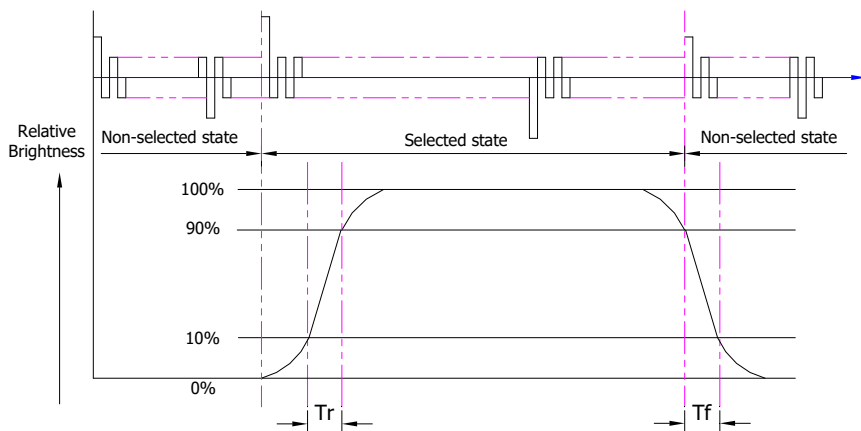
7.1. Optical Characteristics

Ta=25°C, $V_{DD}=2.8V$

Backlight On (Transmissive Mode)	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
	Luminance on TFT(I_f =15mA/LED)		Lv	Normally viewing angle $\theta_x = \varphi_y = 0^\circ$	100	120	-	cd/m ²
	Contrast ratio(See7.3)		CR		-	500	-	
	Response time (See 7.2)		T _R +T _F		-	30	-	ms
	Chromaticity Transmissive (See 7.5)	Red	X _R		-	TBD	-	
			Y _R		-	TBD	-	
		Green	X _G		-	TBD	-	
			Y _G		-	TBD	-	
		Blue	X _B		-	TBD	-	
			Y _B		-	TBD	-	
		White	X _w		-	TBD	-	
			Y _w		-	TBD	-	
	Viewing Angle (See 7.4)	Horizontal	θ _x +	Center CR≥10	-	45	-	Deg.
			θ _x -		-	45	-	
		Vertical	φ _y +		-	45	-	
			φ _y -		-	20	-	
NTSC Ratio(Gamut)					-	55	-	%

7.2. Definition of Response Time

7.2.1. Normally Black Type (Negative)



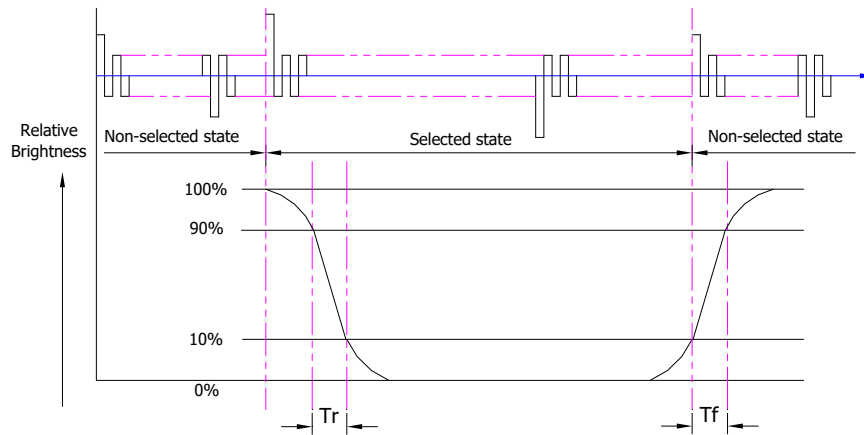
T_r is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

T_f is the time it takes to change from selected state with relative luminance 90% to

non-selected state with relative luminance 10%.

Note: Measuring machine: LCD-5100

7.2.2. Normally White Type (Positive)



T_r is the time it takes to change from non-selected state with relative luminance 90% to selected state with relative luminance 10%;

T_f is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

7.3. Definition of Contrast Ratio

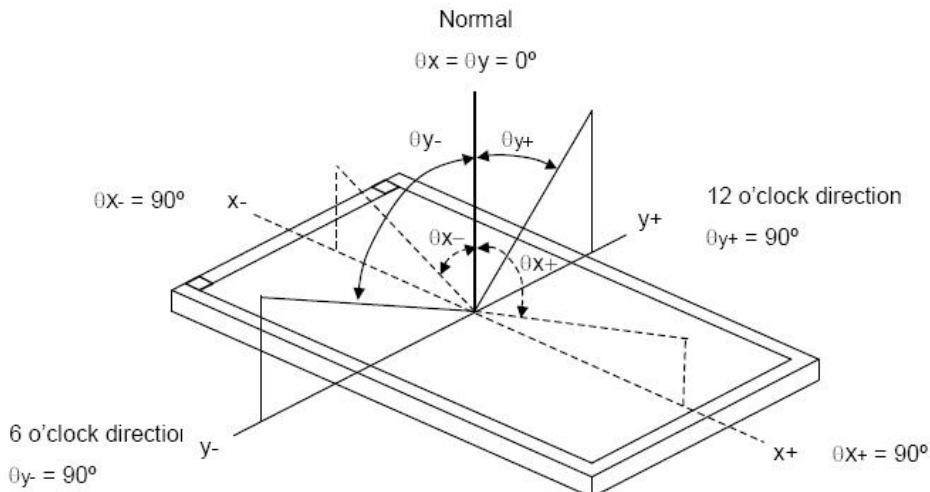
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

7.4. Definition of Viewing Angles



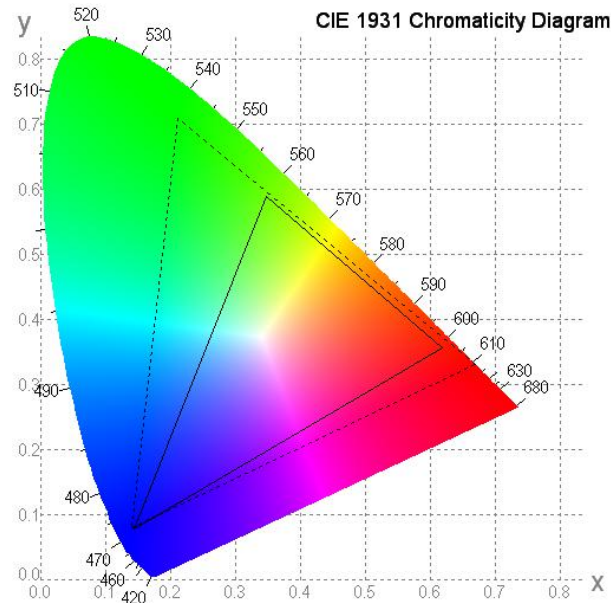
Measuring machine: LCD-5100 or EQUI

7.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)



7.6. Definition of Surface Luminance, Uniformity and Transmittance

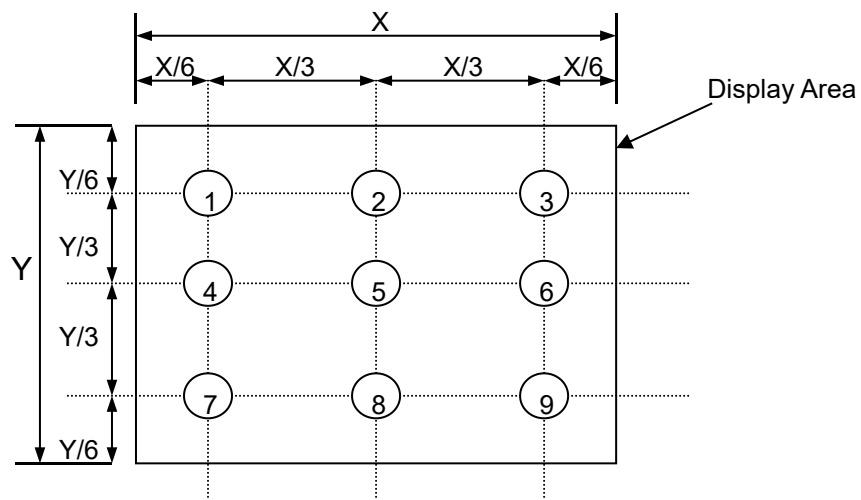
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

7.6.1. Surface Luminance: $L_V = \text{average } (L_{P1}:L_{P9})$

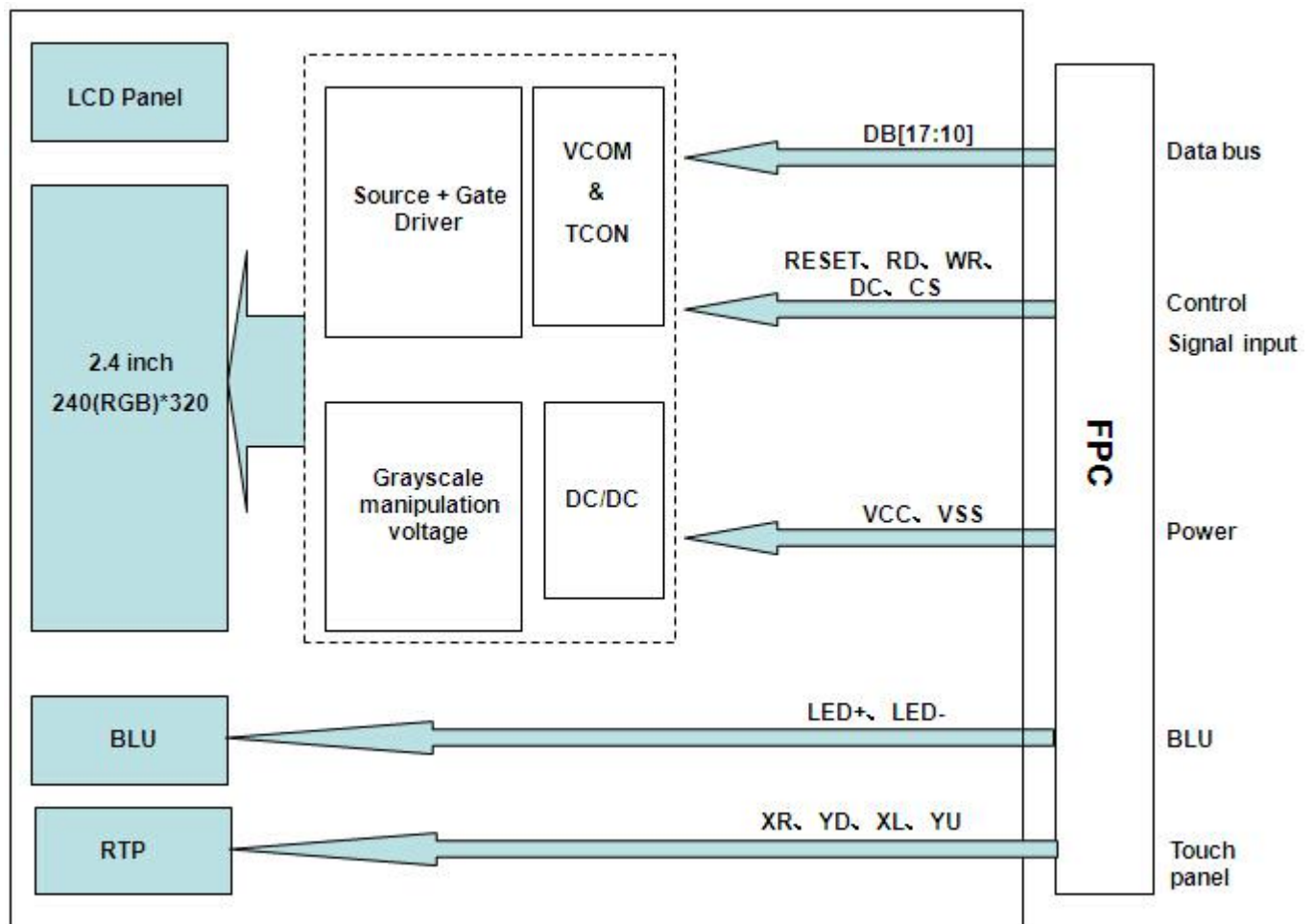
7.6.2. Uniformity = Minimal ($L_{P1}:L_{P9}$) / Maximal ($L_{P1}:L_{P9}$) * 100%

7.6.3. Transmittance = L_V on LCD / L_V on Backlight * 100%

Note: Measuring machine: BM-7



8. Block Diagram and Power Supply

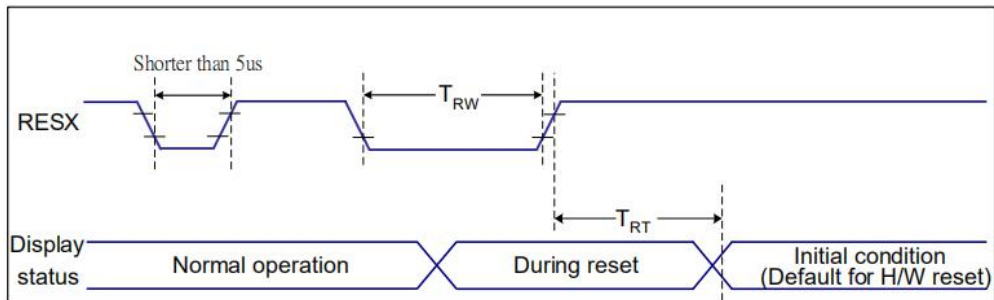


9. Interface Pins Definition

No.	Symbol	Function	Remark
1	NC	No connection	
2	XR	Touch panel terminal	
3	YD	Touch panel terminal	
4	XL	Touch panel terminal	
5	YU	Touch panel terminal	
6	RESET	Reset signal	
7	NC	No connection	
8	NC	No connection	
9	NC	No connection	
10	NC	No connection	
11	D17	Data bus	
12	D16	Data bus	
13	D15	Data bus	
14	D14	Data bus	
15	D13	Data bus	
16	D12	Data bus	
17	D11	Data bus	
18	D10	Data bus	
19	NC(D9)	No connection	
20	D8	Data bus	
21	D7	Data bus	
22	D6	Data bus	
23	D5	Data bus	
24	D4	Data bus	
25	D3	Data bus	
26	D2	Data bus	
27	D1	Data bus	
28	NC(D0)	No connection	
29	RD	Read signal	
30	WR	Write signal	
31	DC	Data/Commander selection	
32	CS	Chip select signal (low active)	
33	VSS	Ground	
34	VCC	Logic supply power	
35	LED-	Led cathode	
36	LED+	Led anode	

10. AC Characteristics

10.1. Reset Timing



Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

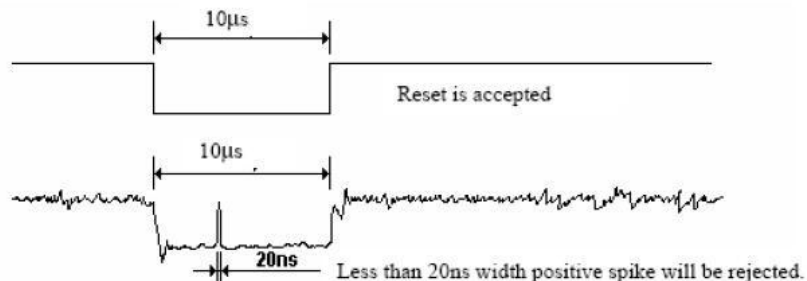
Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition for Hardware Reset.

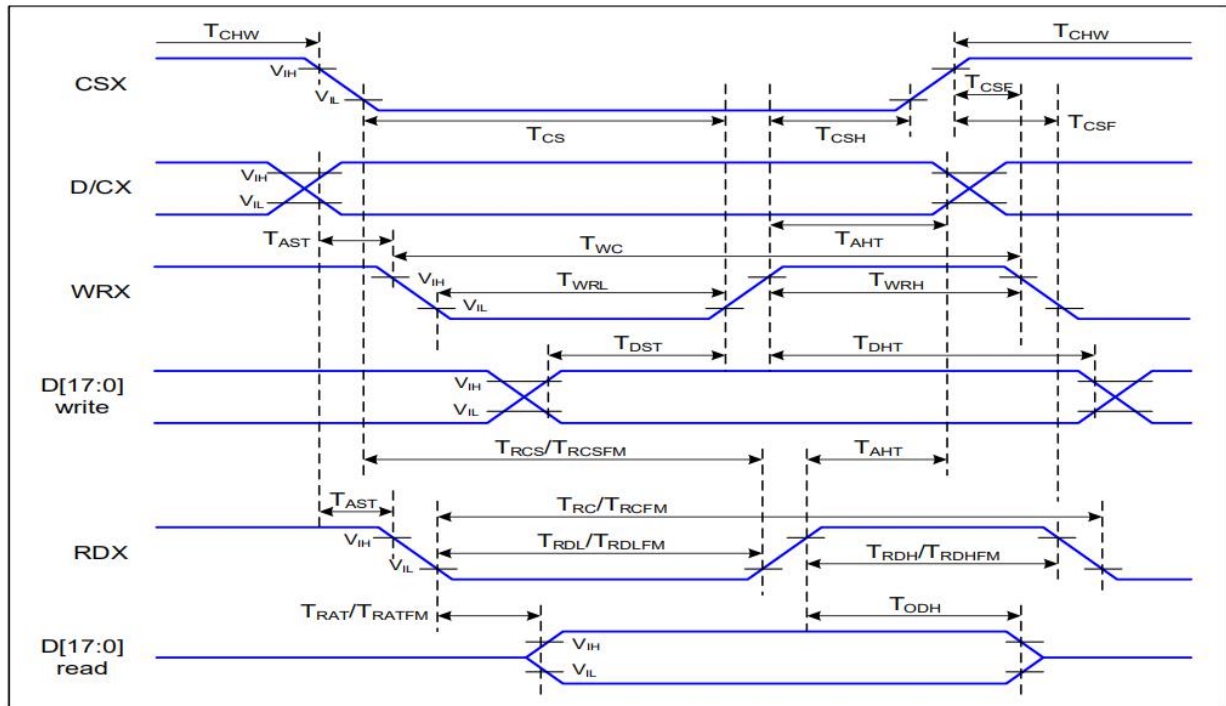
4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

10.2.Interface timing

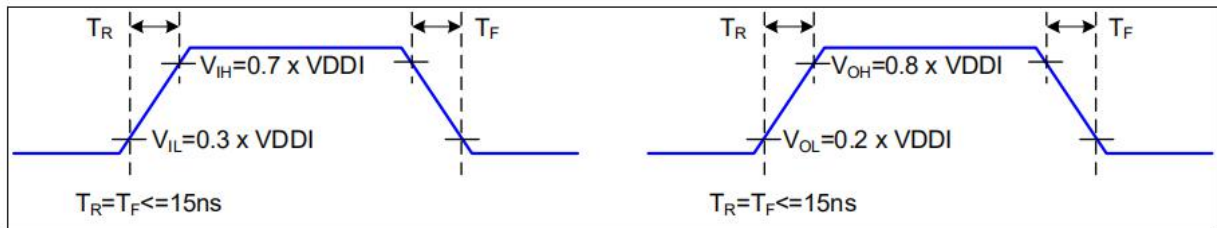
Display Parallel 16-bit Interface Timing Characteristics



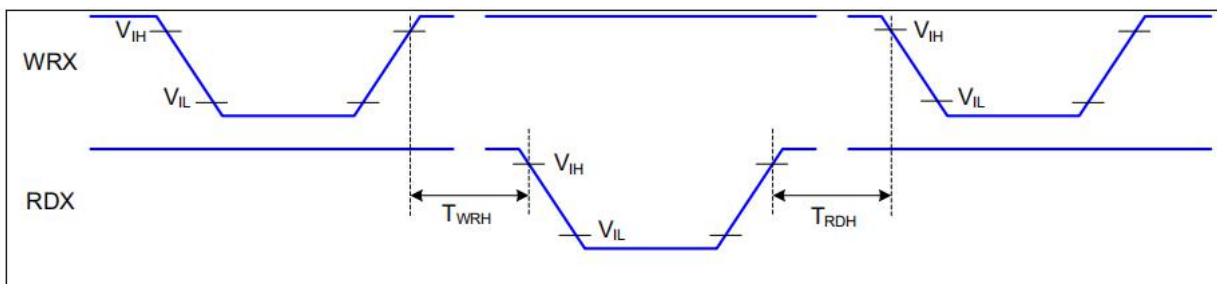
Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T_{AST}	Address setup time	0		ns	-
	T_{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T_{CHW}	Chip select "H" pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T_{CSF}	Chip select wait time (Write/Read)	10		ns	
	T_{CSH}	Chip select hold time	10		ns	
WRX	T_{WC}	Write cycle	66		ns	
	T_{WRH}	Control pulse "H" duration	15		ns	
	T_{WRL}	Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	
D[17:0]	T_{DST}	Data setup time	10		ns	For CL=30pF

	T_{DHT}	Data hold time	10		ns
	T_{RAT}	Read access time (ID)		40	ns
	T_{RATFM}	Read access time (FM)		340	ns
	T_{ODH}	Output disable time	20	80	ns

8080 Parallel Interface Characteristics



Rising and Falling Timing for I/O Signal



Write-to-Read and Read-to-Write Timing

11. Quality Assurance

11.1. Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

11.2. Standard for Quality Test

- 11.2.1. Sampling Plan:
GB2828.1-2012
Single sampling, general inspection level II
- 11.2.2. Sampling Criteria:
Visual inspection: AQL 1.5.
Electrical functional: AQL 0.65.
- 11.2.3. Reliability Test:
Detailed requirement refer to Reliability Test Specification.

11.3. Nonconforming Analysis & Disposition

- 11.3.1. Nonconforming analysis:
 - 11.3.1.1. Customer should provide overall information of non-conforming sample for their complaints.
 - 11.3.1.2. After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.
 - 11.3.1.3. If cannot finish the analysis on time, customer will be notified with the progress status.
- 11.3.2. Disposition of nonconforming:
 - 11.3.2.1. Non-conforming product over PPM level will be replaced.
 - 11.3.2.2. The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

11.4. Agreement Items

Shall negotiate with customer if the following situation occurs:

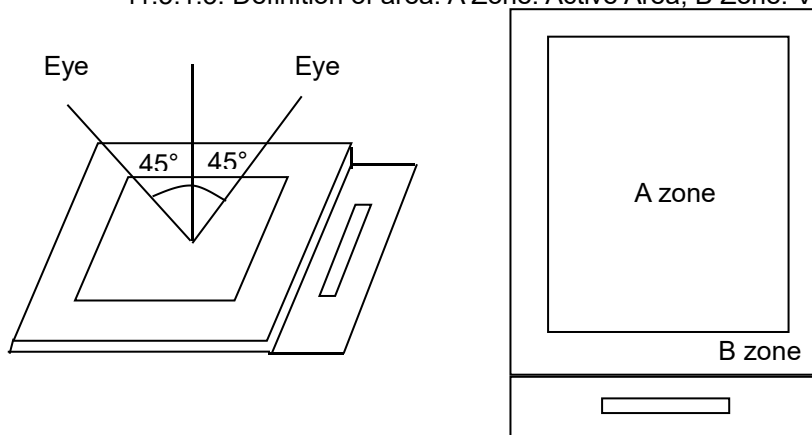
- 11.4.1. There is any discrepancy in standard of quality assurance.
- 11.4.2. Additional requirement to be added in product specification.
- 11.4.3. Any other special problem.

11.5. Standard of the Product Visual Inspection

- 11.5.1. Appearance inspection:
 - 11.5.1.1. The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.

11.5.1.2. The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

11.5.1.3. Definition of area: A Zone: Active Area, B Zone: Viewing Area,

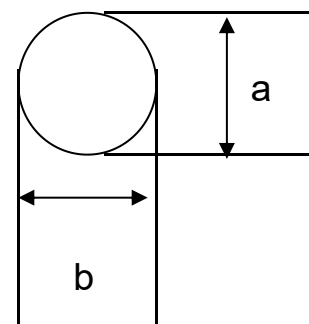


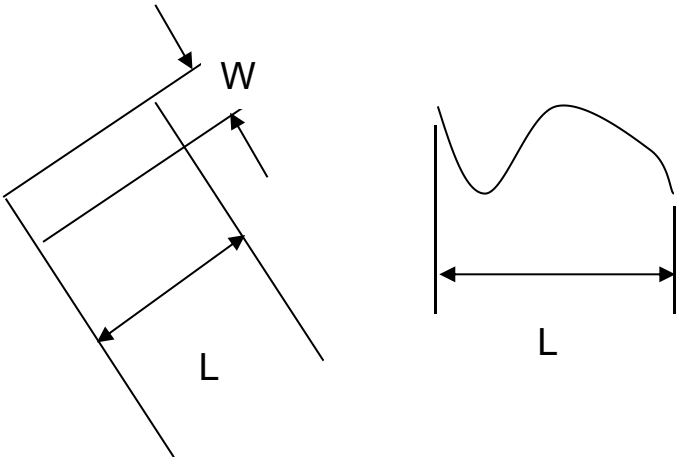
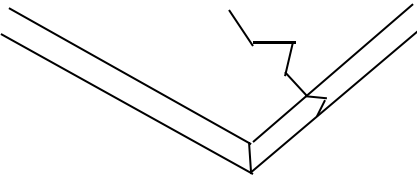
11.5.2. Basic principle:

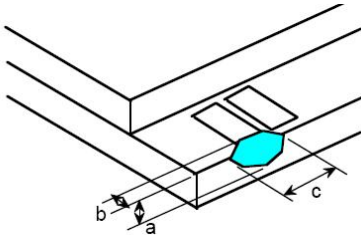
11.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

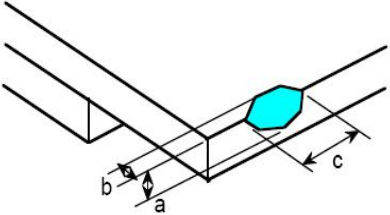
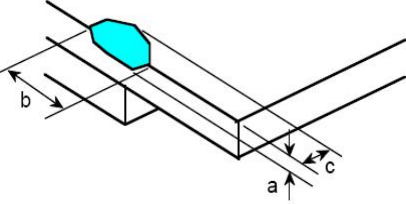
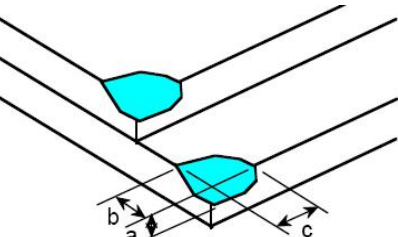
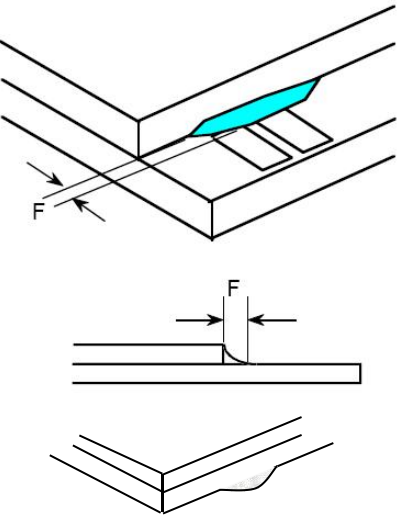
11.5.2.2. New item must be added on time when it is necessary.

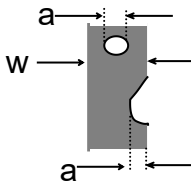
11.6. Inspection Specification

No.	Item	Criteria (Unit: mm)																	
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 $\varphi = (a + b) / 2$	<table><tr><th>Size \ Area</th><th>Acc. Qty</th></tr><tr><td>$\varphi \leq 0.10$</td><td>Ignore</td></tr><tr><td>$0.10 < \varphi \leq 0.15$</td><td>2</td></tr><tr><td>$0.15 < \varphi \leq 0.25$</td><td>1</td></tr><tr><td>$0.25 < \varphi$</td><td>0</td></tr><tr><td>Total</td><td>2 no include $\varphi \leq 0.10$</td></tr></table>	Size \ Area	Acc. Qty	$\varphi \leq 0.10$	Ignore	$0.10 < \varphi \leq 0.15$	2	$0.15 < \varphi \leq 0.25$	1	$0.25 < \varphi$	0	Total	2 no include $\varphi \leq 0.10$				
			Size \ Area	Acc. Qty															
			$\varphi \leq 0.10$	Ignore															
			$0.10 < \varphi \leq 0.15$	2															
			$0.15 < \varphi \leq 0.25$	1															
$0.25 < \varphi$	0																		
Total	2 no include $\varphi \leq 0.10$																		
Distance between 2 defects should more than 3mm apart.																			
02	Electrical Defect (Minor defect)	<table><tr><td></td><td>Display Area</td><td>Total</td><td rowspan="4">Note1</td></tr><tr><td>Bright dot</td><td>0</td><td>0</td></tr><tr><td>Dark dot</td><td>$N \leq 2$</td><td>$N \leq 2$</td></tr><tr><td>Total dot</td><td>$N \leq 2$</td><td>$N \leq 2$</td></tr><tr><td>Mura</td><td colspan="2">Not visible through 5% ND filters.</td><td>Note 2</td></tr></table>		Display Area	Total	Note1	Bright dot	0	0	Dark dot	$N \leq 2$	$N \leq 2$	Total dot	$N \leq 2$	$N \leq 2$	Mura	Not visible through 5% ND filters.		Note 2
			Display Area	Total	Note1														
		Bright dot	0	0															
		Dark dot	$N \leq 2$	$N \leq 2$															
		Total dot	$N \leq 2$	$N \leq 2$															
		Mura	Not visible through 5% ND filters.		Note 2														
Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.																			

03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1" data-bbox="612 748 1238 1055"> <thead> <tr> <th>Length</th><th>Width</th><th>Acc. Qty</th></tr> </thead> <tbody> <tr> <td>/</td><td>$W \leq 0.03$</td><td>Ignore</td></tr> <tr> <td>$L \leq 2.5$</td><td>$0.03 < W \leq 0.05$</td><td>3</td></tr> <tr> <td>$L \leq 2.5$</td><td>$0.05 < W \leq 0.10$</td><td>2</td></tr> <tr> <td>/</td><td>$0.1 < W$</td><td>0</td></tr> <tr> <td colspan="2">Total</td><td>3</td></tr> </tbody> </table> Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$	0	Total		3
Length	Width	Acc. Qty																		
/	$W \leq 0.03$	Ignore																		
$L \leq 2.5$	$0.03 < W \leq 0.05$	3																		
$L \leq 2.5$	$0.05 < W \leq 0.10$	2																		
/	$0.1 < W$	0																		
Total		3																		
04	Glass Crack (Minor defect)	 Crack is potential to enlarge, any type is not allowed.																		

05	Glass Chipping Pad Area: (Minor defect)		<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c > 3.0, b < 1.0$</td><td>1</td></tr><tr><td>$c < 3.0, b < 1.0$</td><td>3</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	3	$a < \text{Glass Thickness}$	
	Length and Width	Acc. Qty									
$c > 3.0, b < 1.0$	1										
$c < 3.0, b < 1.0$	3										
$a < \text{Glass Thickness}$											

06	Glass Chipping Rear of Pad Area: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c > 3.0, b < 1.0$</td><td>1</td></tr><tr><td>$c < 3.0, b < 1.0$</td><td>2</td></tr><tr><td>$c < 3.0, b < 0.5$</td><td>4</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
07	Glass Chipping Except Pad Area: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c > 3.0, b < 1.0$</td><td>1</td></tr><tr><td>$c < 3.0, b < 1.0$</td><td>2</td></tr><tr><td>$c < 3.0, b < 0.5$</td><td>4</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
08	Glass Corner Chipping: (Minor defect) 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td>$c < 3.0, b < 3.0$</td><td>Ignore</td></tr><tr><td colspan="2">$a < \text{Glass Thickness}$</td></tr></table>	Length and Width	Acc. Qty	$c < 3.0, b < 3.0$	Ignore	$a < \text{Glass Thickness}$					
Length and Width	Acc. Qty											
$c < 3.0, b < 3.0$	Ignore											
$a < \text{Glass Thickness}$												
09	Glass Burr: (Minor defect) 	<table><tr><th>Length</th><th>Acc. Qty</th></tr><tr><td>$F < 1.0$</td><td>Ignore</td></tr></table> Glass burr don't affect assemble and module dimension.	Length	Acc. Qty	$F < 1.0$	Ignore						
Length	Acc. Qty											
$F < 1.0$	Ignore											

10	FPC Defect: (Minor defect) 	10.1 Dent, pinhole width $a < w/3$. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.										
11	Bubble on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>$\varphi \leq 0.20$</td><td>Ignore</td></tr><tr><td>$0.20 < \varphi \leq 0.30$</td><td>4</td></tr><tr><td>$0.30 < \varphi \leq 0.50$</td><td>1</td></tr><tr><td>$0.50 < \varphi$</td><td>None</td></tr></table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
12	Dent on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>$\varphi \leq 0.20$</td><td>Ignore</td></tr><tr><td>$0.20 < \varphi \leq 0.30$</td><td>4</td></tr><tr><td>$0.30 < \varphi \leq 0.50$</td><td>1</td></tr><tr><td>$0.50 < \varphi$</td><td>None</td></tr></table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
13	Bezel	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.										
14	Touch Panel	D: Diameter W: width L: length 14.1 Spot: $D < 0.25$ is acceptable $0.25 \leq D \leq 0.4$ 2dots are acceptable and the distance between defects should more than 10 mm. $D > 0.4$ is unacceptable 14.2 Dent: $D > 0.40$ is unacceptable 14.3 Scratch: $W \leq 0.03$, $L \leq 10$ is acceptable, $0.03 < W \leq 0.10$, $L \leq 10$ is acceptable Distance between 2 defects should more than 10 mm. $W > 0.10$ is unacceptable.										
15	LCD Ripple	Touch the touch panel, cannot see the LCD ripple. Pen: R 0.8mm silicon rubber. Operation Force:(80g)										
16	PCB	16.1 No distortion or contamination on PCB terminals. 16.2 All components on PCB must same as documented on the BOM/component layout. 16.3 Follow IPC-A-600F.										

17	Soldering	Follow IPC-A-610C standard
18	Electrical Defect (Major defect)	The below defects must be rejected. 18.1 Missing vertical / horizontal segment, 18.2 Abnormal Display. 18.3 No function or no display. 18.4 Current exceeds product specifications. 18.5 LCD viewing angle defect. 18.6 No Backlight. 18.7 Dark Backlight. 18.8 Touch Panel no function.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

11.7. Classification of Defects

11.7.1. Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

11.7.2. Two minor defects are equal to one major in lot sampling inspection.

11.8. Identification/marketing criteria

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

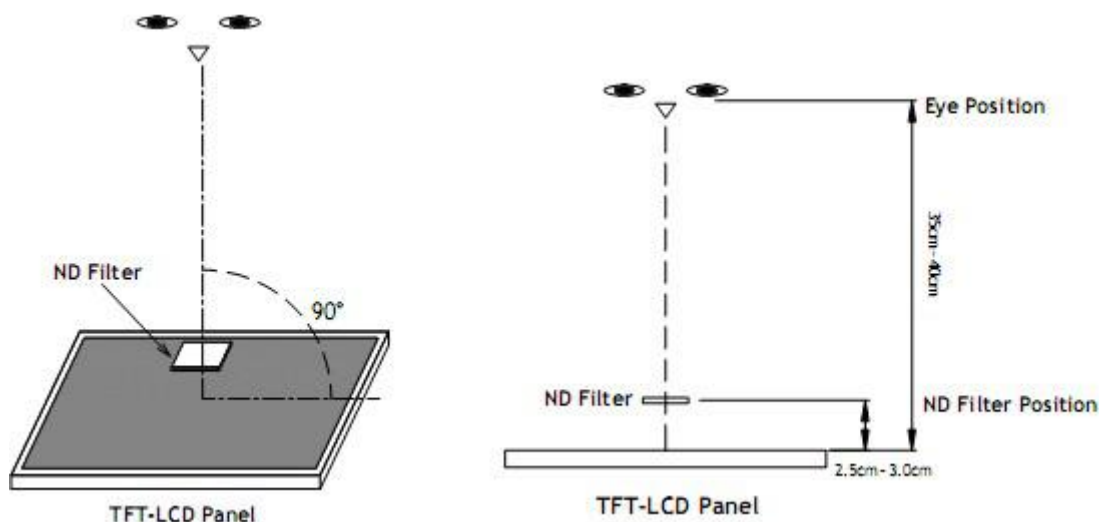
11.9. Packaging

11.9.1. There should be no damage of the outside carton box, each packaging box should have one identical label.

11.9.2. Modules inside package box should have compliant mark.

11.9.3. All direct package materials shall offer ESD protection

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.



Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is $350\text{mm} \pm 50\text{mm}$.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is $350\text{mm} \pm 50\text{mm}$.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area.

12. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	70℃, 96Hrs	2	GB/T2423.2-2008
2	Low Temperature Operating	-20℃, 96Hrs	2	GB/T2423.1-2008
3	High Humidity Storage	50℃, 90%RH, 96Hrs	2	GB/T2423.3-2016
4	High Temperature Storage	80℃, 96Hrs	2	GB/T2423.2-2008
5	Low Temperature Storage	-30℃, 96Hrs	2	GB/T2423.1-2008
6	Thermal Cycling Test Storage	-20℃, 60min~70℃, 60min, 20 cycles.	2	GB/T2423.22-2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction.	-	GB/T5170.14-2009
8	Electrical Static Discharge	Air:±8KV 150pF/330Ω 5 times Contact:±4KV 150pF/330Ω 5 times	2	GB/T17626.2-2018
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	-	GB/T2423.8-1995

Note1. No defection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value

13. Precautions and Warranty

14.1 Safety

- 13.1.1. The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.
- 13.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

13.2. Handling

- 13.2.1. Reverse and use within ratings in order to keep performance and prevent damage.
- 13.2.2. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

13.3. Storage

- 13.3.1. Do not store the LCD module beyond the specified temperature ranges.
- 13.3.2. Strong light exposure causes degradation of polarizer and color filter.

13.4. Metal Pin (Apply to Products with Metal Pins)

13.4.1. Pins of LCD and Backlight

- 13.4.1.1. Solder tip can touch and press on the tip of Pin LEAD during the soldering

13.4.1.2. Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

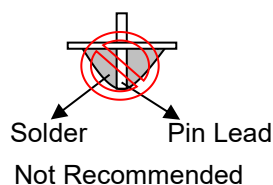
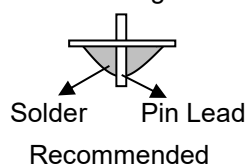
Maximum Solder Temperature: 370°C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20°C

Typical Soldering Time: ≤3s

13.4.1.3. Solder Wetting



13.4.2. Pins of EL

- 13.4.2.1. Solder tip can touch and press on the tip of EL leads during soldering.

- 13.4.2.2. No Solder Paste on the soldering pad on the motherboard is recommended.

13.4.2.3. Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270~290°C

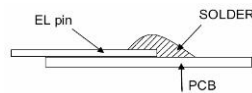
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body): 2.0mm

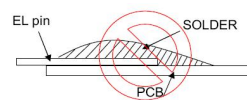
- 13.4.2.4. No horizontal press on the EL leads during soldering.

- 13.4.2.5. 180° bend EL leads three times is not allowed.
-

13.4.2.6. Solder Wetting

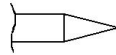


Recommended

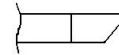


Not Recommended

13.4.2.7. The type of the solder iron:

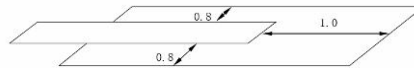


Recommended



Not Recommended

13.4.2.8. Solder Pad



13.5. Operation

- 13.5.1. Do not drive LCD with DC voltage
- 13.5.2. Response time will increase below lower temperature
- 13.5.3. Display may change color with different temperature
- 13.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.
- 13.5.5. Do not connect or disconnect the LCM to or from the system when power is on.
- 13.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.
- 13.5.7. Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- 13.5.8. *Do not display the fixed pattern for long time (we suggest the time not longer than one hour) because it will develop image sticking due to the TFT structure.*

13.6. Static Electricity

- 13.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 13.6.2. The normal static prevention measures should be observed for work clothes and benches.
- 13.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

13.7. Limited Warranty

- 13.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- 13.7.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.
- 13.7.3. After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

14. Packaging

TBD

15. Outline Drawing

